Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently amended) A computer-implemented method for encoding an m-bit chain wherein errors do not spread to more than n bits, n being lesser or equal to m, said method comprising:

choosing an irreducible generator polynomial of degree p, p being greater or equal to n and such that m is lesser or equal to $p(2^p-1)$;

building a matrix using 2^p elements of a galois field (GF), generated by the generator polynomial, comprising 2^p-1 elements of a multiplicative group $a^0, a^1, a^2 \ldots a^{p-1}$ and $\varnothing$, a null element for addition and, using p x p blocks wherein a first line is one first element and other lines are other elements of the GF multiplicative group obtained by a circular permutation of the first line, in the following way:

defining a first set of p columns comprising a succession of $2^p + 2$ blocks wherein first lines are respectively $\varnothing$, $\varnothing$ and 2p times a^0;

defining a second set of p columns comprising a succession of $2^p + 2$ blocks wherein the first lines are successively $\varnothing, a^0, \varnothing, a^0, a^1, a^2 \ldots a^{p-1}$; and

defining a third set of p columns comprising a succession of $2^p + 2$ blocks wherein the first lines are successively $a^0, \varnothing, \varnothing, a^0, a^0, (a^{p-1})^{-1}, (a^{p-2})^{-1} \ldots (a^1)^{-1}$; and

computing a bit chain code for the m-bit chain by performing a matrix multiplication of a bit chain wherein m MSB bits are the m-bit chain and remaining LSB bits are zero, by the previously built matrix and appending to the m-bit chain the bit chain code as new LSB bits.

2. (Previously amended) The method of claim 1 wherein the choosing step comprises choosing the generator polynomial

$G(X) = X^8 + X^4 + X^3 + X^2 + 1$

m being assigned to 512, p being assigned to 8.

3. (Previously amended) The method of claim 2 wherein the building step further comprises:

suppressing from the just built matrix, first three columns, three last rows of third 8 x 8 blocks for each column, five last rows of fourth 8 x 8 blocks for each column, three last rows following 8 x 8 blocks for each column, and five last rows of a last block for each column.

4. (Previously amended) The method of claim 1 wherein the building step further comprises:

suppressing the third set of p columns; and

suppressing first p rows in the first and second sets of p columns.

5. (Currently amended) A computer-implemented method for decoding a received bit chain wherein errors do not spread to more than n bits, said received bit chain comprising an m bit chain formed by m MSB bits and a code bit chain formed by p remaining LSB bits, p being a degree of an irreducible generator polynomial, p being greater or equal to n such that m is lesser or equal to $p(2^p-1)$, said method comprising:

building a matrix using 2^p elements of a galois field (GF), generated by the generator polynomial comprising 2^{p-1} elements of a multiplicative group, a^0, a^1, a^2 . . . a^{p-1} and $\varnothing$, a null element for addition and, using p x p blocks wherein a first line is one first element and other lines are other elements of the GF multiplicative group obtained by a circular permutation of the first line, in the following way:

defining a first set of p columns comprising a succession of 2^p+2 blocks wherein first lines are respectively $\varnothing$, $\varnothing$ and 2p times a^0;

defining a second set of p columns comprising a succession of 2^p+2 blocks wherein the first lines are successively $\varnothing$, a^0, $\varnothing$, a^0, a^1, a^2 ... a^{p-1}; and

defining a third set of p columns comprising a succession of 2^p+2 blocks wherein the first lines are successively a^0, $\varnothing$, $\varnothing$, a^0, a^0, $(a^{p-1})^{-1}$, $(a^{p-2})^{-1}$... $(a^1)^{-1}$;

computing a syndrome bit chain for the received bit chain by performing a matrix multiplication of said received bit chain by the previously built matrix; and

correcting errors introduced in one of the 2^{p-1} x p bit sub chains forming the m MSB bits of the received bit chain by executing the following steps:

performing a division in the GF, a divider being Sa, a p-bit chain formed by p MSB bits of the syndrome bit chain, a dividend being Sb, the following p MSB bits after Sa of the syndrome bit chain and obtaining an exact quotient p bit chain;

using an exact quotient as a range of the p bit sub chain in the m MSB bits of the received bit chain to select a p bit sub chain containing errors; and

taking Sa as an error pattern, changing a value of each bit of the selected p bit sub chain at a location identified by the bits in Sa which are set to 1.

6. (Previously amended) The method of claim 5 wherein the correcting step further comprises:

correcting a p-bit sub chain of the bit chain code by applying as an error pattern, the p-bit chain formed by a p-bit sub chain in the syndrome bit chain having a same range in the syndrome as the P-bit sub chain in the bit chain code.

7. (Previously amended) The method of claim 5 further comprising, before the steps for correcting errors, the following steps for detecting the errors in the 2^{p-1} x p bit sub chains forming the m MSB bits of the received bit chain:

if the p bit syndrome is zero, concluding that there is no error and skipping the execution of the steps for correcting errors; and

detecting if the errors are correctable by executing the following steps:

computing in the GF two elements of the GF Sa^2 and Sb x Sc, Sc being the p LSB bits of the syndrome bit chain;

comparing the two elements Sa^2 and Sb x Sc;

if the compared elements are different, concluding that the errors are uncorrectable and skipping the execution of the correcting steps; and

if the compared elements are identical and if Sa is not all-zero, concluding that the errors are correctable and executing the steps for correcting errors.

8. (Previously amended) The method of claim 7 further comprising for detecting errors in the bit chain code of the receiving bit chain the steps of:

determining if a p-bit sub chain of the bit chain code is not zero and if said p-bit chain is not all-zero, applying the step for correcting errors in the bit chain code to said p-bit sub chain of the bit chain code.

9. (Previously amended) The method of claim 8 wherein the step of computing a division in the GF comprises:

creating a lookup table, associating an index from 0 to 2^{p-1} to each element of the GF multiplicative group, said index being a rank of the GF element in the GF multiplicative group;

associating an index Ib to Sb and an index Ia to Sa by reading the lookup table;

performing a subtraction modulo 2^{p-1} of Ib + 2^{p-1} minus Ia; and

reading in the lookup table the GF element corresponding to a resulting index of the subtraction the resulting index obtained in the performing a subtraction step, the GF element being a result of the step of computing a division in the GF.

10. (Previously amended) The method of claim 8 wherein the step of computing in the GF, the two elements Sa^2 and Sb x Sc comprises:

creating a lookup table, associating an index from 0 to 2^{p-1} to each element of the GF multiplicative group, said index being the rank of the GF element in the GF multiplicative group;

associating an index Ib to Sb, an index Ic to Sc and an index Ia to Sa by reading the lookup table;

performing an addition modulo 2^{p-1} of Ia and Ia;

performing an addition modulo 2^{p-1} of Ib and Ic; and

reading in the lookup table the two GF elements corresponding to the two resulting index of the two additions, the two GF elements being the two results of the step of computing in the GF, the two elements Sa^2 and Sb x Sc.

11. (Previously amended) The method of claim 8 wherein the step of computing in the GF, the two elements Sa^2 and Sb x Sc comprises:

creating a first lookup table having 2^{p-1} entries, associating to each element of the GF, its square value computed modulo 2^{p-1};

creating a second lookup table having 2^{p-1} x 2^{p-1} entries, each entry being the GF element corresponding to one possible precomputed product of two GF elements; and

reading respectively in the lookup tables the two GF elements corresponding to Sa^2 and to the product Sb x Sc.

12. (Previously amended) The method of claim 11 wherein the choosing step ~~consists in~~ comprises choosing the generator polynomial

$G(X) = X^8 + X^4 + X^3 + X^2 + 1$

m being assigned to 512, p being assigned to 8.

13. (Previously amended) The method of claim 12 further comprising as the last step for building a matrix, the step of:

suppressing from the just built matrix, first three columns, three last rows of third 8 x 8 blocks for each column, five last rows of fourth 8 x 8 blocks for each column, three last rows of following 8 x 8 blocks for each column and five last rows of a last block for each column.

14. (Previously amended) The method of claim 6 wherein the building step further comprises:

suppressing the third set of p columns; and

suppressing the first p rows in the first and second set of p columns.

15. (Canceled)

16. (Canceled)